SEA ICE IDENTIFICATION USING DUAL-POLARIZED Ku-BAND SCATTEROMETER DATA

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In this paper, we describe the potential of using dual-polarized scatterometer returns from the polar oceans to identify the edge of the ice cover. This icc edge could be used to compute the ice extent which is defined as that area enclosed by the outer boundary of the ice pack. The trends in the maxima and minima of the annual ice extents of the Arctic and Antarctic sea ice covers have been suggested as useful indicators of climatic changes. Earlier studies of ice extent have relied principally on weekly maps of sea icc produced by the Navy-National Oceanographic and Atmospheric Administration (NOAA) National Ic c Center. These maps are the result of a subjective analysis of a combination of visible, infrared and passive microwave data from various spaceborne sensors as wc]] as observations of opportunity from aircraft and ships. Recent investigations have been based on the ice extent derived from data collected by the Scanning Multi channel Microwave Radiometer (SMM R) instrument and its successor, Special Sensor Microwave image (SSM /1). Various algorithms have been developed to estimate the total sea ice concentration using these multichannel passive microwave observations. The most used widely is the one developed by members of the Nimbus-7 SMMR team. It is based on a mixing formulation which uscs the polarization gradient of the brightness temperature at 1 8GHz and spectral gradient at 18GHz and 37GHz to estimate the icc type and open water concent rations for a given set of multichannel observations. This algorithm is affected by the spatial and temporal variations in the microwave signature of sea ice. Also, the passive observations are affected by local meteorological conditions. We suggest here that a dual-polarized scatterometer could be used to discriminate sea ice fro]]] open water ar Id t hat a routine i cc edge product derived from active microwave data could provide an interesting complement to the SSM/I estimates.

With the realization that open water would typically have a polarization signature that is distinct from that of the principal icc types in the summer and winter Arctic and Antarctic, wc examined the dual-polarized data collected by the Seasat Scatterometer (SASS) during July of 1978. The algorithm wc describe in this paper utilizes a combination of backscatter intensity and polarization behavior to separate the open water pixels from tbc sea ice pixels and was successfully demonstrated with the SASS data. This indicates that the algorithm described herein can be used to produce routine observations of the icc cover using data collected by the NASA Scatterometer (NSCAT) to be launched on ADEOS-11996.

Preferred topic area: Applications of remote sensing to sea ice